LAMPREY TECHNICAL REVIEW COMMITTEE
NH Instream Flow Pilot Program
New Hampshire Department of Environmental Services
PO Box 95 - 29 Hazen Drive - Concord, NH 03302-0095
Phone: 603-271-3548 Fax: 603-271-7894
Email: wives@des.state.nh.us

Lamprey TRC Meeting Minutes
Monday, February 13, 2006
1:00 pm – 3:20 pm
Conference Room, NH Fish & Game
11 Hazen Drive, Concord, NH

Members Present:	**Technical Representatives**
Ralph Abele	US EPA / Manager of NH State Program Unit
Douglas Bechtel	Conservation Interests, The Nature Conservancy
Brian Gallagher	Business Interests, NH Water Works Association
James Hewitt	Business Interests, Wright-Pierce Engineers, LRAC
Vernon Lang	US Fish and Wildlife Service
Carl Paulsen, Vice Chair	Conservation Interests, NH Rivers Council
Members Absent:	
Richard Cooney	NH House of Representatives, RR&D Committee
Colleen Dreher	Business Interests, Durham Boat Company
Robert Flynn	US Geological Survey
William Ingham	NH Fish and Game Department
Carl R. Johnson	NH Senate, Senate Environment Committee
Kenneth D. Kimball, PhD	Conservation Interests, Appalachian Mountain Club Research Department
Jim MacCartney, Chair	Conservation Interests, Trout Unlimited/River Restoration Specialist
Ronald Rayner	Business Interests, Business Industry Association of NH

Others Present	**Affiliation**
Jeffrey Legros	NEIHP - UMASS
Joseph Rogers	NEIHP – UMASS
Piotr Parasiewicz	NEIHP – UMASS
Lee Carbonneau	Normandeau Associates
Don Kretchmer	Normandeau Associates
Tom Ballestero	University of New Hampshire
Mark Hutchins	Normandeau Associates
Al Larson	Normandeau Associates
Drew Trested	Normandeau Associates
Jack Barnes, Jr.	NH Senate, Senate District 17
Franklin C. Bishop	NH House, District 2
Jasen Stock	NH Timberland Owners Association
Robert Flynn	US Geological Survey
Eileen Miller	LRAC
Michael Metcalf	Underwood Engineers
John Brooks	Emery & Garrett Groundwater, Inc.

DES Staff Present:

Wayne Ives, Instream Flow Specialist, Watershed Management Bureau
Marie Loskamp, Executive Secretary, Watershed Management Bureau

1:00 – 1:15 **Open Meeting, Introductions and Approve Minutes of March 14, 2005 Meeting**

Carl Paulsen called the meeting to order, introductions were made and Carl asked for a motion to accept the March 14, 2005 meeting minutes.

- **Motion made by Ralph Abele to accept the meeting minutes of March 14, 2005, seconded by James Hewitt, there were no comments, and the minutes were unanimously accepted.**

1:15 – 1:00 **Brief update on pilot program and schedule – Wayne Ives**

Today's meeting is to look at the Lamprey Task 4 results. Site specific studies have been conducted to identify what the protected entities, the IPUOCRs, are. These were in Task 1 and Task 3 and they are documented here in Task 4 in their final form. The process included a review by the WMPAAC made up of local stakeholders and government agencies within the watershed. This Task 4 identifies the final list of flow dependent IPUOCRs and gives the proposed list of assessment methods for determining the flows for these IPUOCRs. We are here today to hear what those flow dependent flow assessment processes are and we will have a couple of weeks to go over that and review it. It is a very long document, and you should have had an email that said where you could find a copy of it. If you still have trouble getting it then we will work towards getting a copy for you. The report is in draft stage, the results of today's meeting and your comments over the next couple of weeks will result in the final report. The final report dictates what goes into Task 5. Essentially, what are they going to do to determine flows that are protecting those IPUOCRs? We are here to hear the whole process outlined and get your comments. If you have any comments, please give them today or by email to Wayne Ives within the next two weeks. We want people's written comments back to Wayne two weeks from today.

- **Mail copies of report to Senator Barnes and Representative Bishop**.

1:00 – 3:15 **NAI –- Draft Task 4 Report – Presentation of final IPUOCRs and draft assessment methods for defining protected flows, questions and answers.**

Wayne - Don Kretchmer is leaving to go to the NH Lakes Association and he is passing the torch on to Al Larson. Al's resume is in the proposal so he is stepping right in to take over the project and Don is not gone exactly, he is just becoming Wayne's instream flow specialist as the President of the NH Lakes Association.

Don hopes to remain in this process because it has been a great experience working on this river and the Souhegan. He is very interested in how it all turns out.

Don Kretchmer – Today we are going to talk about some of the instream flow methods. First I am going to bring you up to speed on IPUOCRs that we are trying to protect on the Lamprey River. The project team, these are basically the disciplines and how they are distributed amongst the various entities involved in this. Normandeau Associates is limnology, aquatic ecology, ecosystem restoration, wetland and terrestrial assessment (Lee Carbonneau).

The University of New Hampshire is doing the hydrology, geomorphology, hydraulics, groundwater (Tom Ballestero) and also some of the financial possibilities in the water management plan.

The University of Massachusetts is basically everything within the streambank, the fish, the aquatic resources (Piotr Parasiewicz and his team).

IPUOCR entities are what we are focusing on here: instream, public uses and outstanding characteristics and resources. Protected Instream Flow (PISF) and we will refer to that quite a bit. What we are looking for is the flows that protect and maintain these protected entities.

Why are we here today? In the statute it says the consultant will produce the draft report describing the results of the IPUOCR entities research, an on-stream survey and then

propose methods to assess their flow needs. We submitted this draft report to the committee and we are actually waiting for review and comments. This all started with an on-stream IPUOCR survey. We created GIS maps, we talked to all the agencies and found out where we thought that resources should be looked for and then we went out and looked for them to see if they existed. Now in the case of some of the threatened and endangered species and some of the rare habitats, we were not necessarily there at the right time to see them. It doesn't mean they don't exist because we didn't see them. Some of them we did see and we did find a few other things that were not on our list. We photo documented the whole thing, recorded the hydromorphological features and then developed IPUOCR GIS layers.

We first decided which IPUOCRs on the list of IPUOCRs in the statute are on the Lamprey.

Representative Bishop -On the habitat that you didn't find, did you find evidence that they were there?

Don – In some instances, I think Lee is going to talk a little bit more about that. Some of the species they only flower at a certain time during the year. We just weren't there when it was flowering. Some of the reports are very old in history. It hasn't been confirmed in ten to twenty years in some instances. It may be that these species are not there anymore, it just needs a more thorough search to find out if they are actually there are not.

Representative Bishop – The habitat you are talking about is plant life?

Don – Correct.

Don – Once we have this list of IPUOCRs we need to determine if it flow dependent or not. Some are upland resources and are not flow dependent. If we get into this no category we eliminated them from the study. These decisions are all documented in our report. Then there were ones that were definitely Flow dependent and those are the fish species, the aquatic resources, a lot of the riparian zone, the wetlands, a lot of the animal species, recreation, all are flow dependent resources. Then we had to ask the question is this IPUOCR entity dependent on maintaining acceptable, minimum, average or high flows. The difference in those classifications has bearing on how we treat those resources in the actual flow studies. If they are dependent on low flows, which is the area that we feel that we are going to do most of the management at because that is where we have the ability to influence flows the most is at these lower flows, then we determine an acceptable minimum protected instream flow for that entity. We know we have to develop an instream flow for those entities and we provided methods to do all of that. If the entity is dependent on average or high flows and an example of that is recreation, white water canoeing. If the water management alternatives are going to affect the average or high flows, and an example of that is something like if we skimmed off floods in the spring, through that water into storage and then released it in the summer, so it changes those average or high flows during the boating season, then we have a potential to influence some of those high flows. If the management alternatives, when we get down to the water management plan have some alternatives that are going to affect those flows we will be much more quantitative in how we analyze those resources. For now we are just looking at them qualitatively. If we need to revisit them, we will. Most of the management of this system is going to happen at the low flows. Once we determine what the PISF is for all these resources that go together in a large matrix, then we decide how we are going to get the water to maintain those resources.

Representative Bishop –Have you taken into consideration the fact that for some of the communities their water supplies are recharged by the Lamprey River?

Don – Yes, absolutely. In fact Tom will be talking about that, which is one of the last items on the agenda.

I am going to be talking about recreation, water storage, and pollution abatement. Lee is going to talk about some of these communities and some of the plants and wildlife. Piotr is going to talk about the fish and fish habitat and Tom is going to talk about water supply and groundwater.

Recreation – Don

The IPUOCRS on the Lamprey are swimming (exclusively in impounded areas), kayaking, canoeing and rowing. The rowing is on the flat water sections, the kayaking and canoeing happen on the flat water sections all summer but those sections don't change that much in response to flow. There are some whitewater sections that are run at average to high flows. Canoeing at lower flows is ill advised out there. It is ridiculously rocky and impossible to kayak and canoe at low flows. The resources are flow dependent, at least the canoeing and kayaking in the free flowing sections are flow dependent at average to high flows. The other ones may or may not be flow dependent, the swimming, the flat water canoeing, kayaking and rowing are very loosely related to flow. Many of the non-impounded reaches are non-navigable at low flow. We will re-evaluate recreation if the water management plan influence average to high flows. We will do a qualitative survey and we will go out and talk to kayakers and canoeists to find out what their optimal flows are, what flows they like to run, what the minimum flow is that they like to run and if any of our water management plan alternatives have a potential to effect those flows we will certainly look at a them more quantitatively.

Representative Bishop – Find any swimming areas, you mentioned a couple of campgrounds. The Town of Raymond also has one behind their elementary school.

Don – Yes, that is upstream of the designated reach and so it probably will not be directly in this study.

Representative Bishop – How far up the river is your designated reach?

Don – The designated reach is from the Epping/Lee line down to Newmarket/Durham line so it is about a 12 mile stretch. The whole watershed comes into play in developing flows, generating flows for that designated reach. The designated reach is where all the intensive studies are going to happen.

Question - What about fishing, is that imbedded within recreation or is that a separate IPUOCR.

Don – It is kind of imbedded within recreation but it is also a big part of the fisheries. If the fisheries are there then the fish follow and it is coming out of the instream resources.

Water Storage – Don

There is storage above Wiswall Dam that is used by Durham for drinking water and this probably bears a little more discussion in that UNH is on the team and UNH is also one of the major withdrawals on the river. The way the team has chosen to deal with this is that all contact with Durham and UNH is going to happen from Normandeau's side and not from UNH's side. We built a little bit of a firewall so that Normandeau is going to do all interviews with UNH just to make it a much cleaner project. Normandeau will handle all of that, we will talk with Durham, review the records, determine the flow needs and we will take into account the proposal Durham has to raise Wiswall dam.

Comment: Don regarding the dam, I think it is not raising but there is a pending request to increase the maximum drawdowns 16 to 18 inches.

Don – That is correct.

Comment: You may or may not know this but there are all kinds of plans relating to that dam regarding fish paths and the state has administrative orders against the town as far as inspecting the dam and increasing the flood gates, there is a lot related to that dam going on simultaneously.

Don - Piotr was involved with some of the fish-way design, gave advice on the fish paths. All of that needs to be weighed in terms of how this ultimately all washes out.

Pollution Abatement – Don

There is one permitted discharge at Epping above the designated reach, but one thing that is important about that is there may be a significant portion of the flow during low flow times. We will go through and review all permits. There is a waste load allocation study that

was done for that. One of the things that is kind of interesting is a regional wastewater alternative project going on. If Epping is to be included in that which we don't know at this point and maybe move the wastewater discharge out of the watershed that could have a significant impact on flows. One thing we need to do is to determine how much flow in the river during low flow times comes from the Epping plant.

Communities &Plant Species – Lee Carbonneau

Some of the communities that we will be evaluating are oxbow and backwater wetlands along the Lamprey River. Many of the ones we saw were either above Wiswall Dam, below the falls, or further down in Newmarket around the island. These are some of the ones that have a more direct connection to the river and are most likely to be influenced by flow changes. They are typically dependent upon flooding, getting the water levels up in the spring and as the season progresses through the summer and water levels drop, you get those concentric rings of vegetation types. These will be evaluated by what we are calling the Flood Plane Transect Model. Many of these resources are going to be evaluated using the same technique. We have several different flood plane forest types. There is one known white oak flood plane forest as well as quite a few red maple flood plane forests which is a more common variety on medium and small rivers. There are some small areas of silver maple flood plane forests which are a little more typical of some of your medium and average in your larger rivers. Those are at the downstream end of the Lamprey in the vicinity of the moat island area. These are more dependent on high spring flows, as opposed to low flows. The floods in the spring tend to produce competition from other plants and bring in nutrients and these plants are adapted to that and eliminate some of the competitive upland plants. There are several more channel related plant communities, there are the high energy riverbanks, and then also some rapids communities. The rapids having river weed and knotty pond weed, two species that we will be looking at. The high energy riverbanks are located on some of the islands in midstream and also along some of the rocky shores, they often have some unique assemblages of plants, variable water levels at different times, varies sub-straights so it can be a very unique combination of factors leading to quite a variety of plants. Knotty pond weed and water marigold would be assessed in the channel, these are aquatic plants that will be in the water all the time and we will be looking at those through the flood plane transect model, but also looking at some of the information Piotr develops on the instream channel changes with different water flows. The emergent plants on the list will be assessed through the flood plane model. They are not likely to be located right in the channel. Some of them are associated with the swamps, wooded swamps, and backwater wetlands.

We are looking at wildlife habitat and we have 3 special concern turtles that are known to be on the Lamprey. The wood turtle is the most riparian of these. The best habitats are upstream of the reach we will be dealing with but there is some potential habitat within our study area. Wood turtles will be sensitive to winter flows because they hibernate under the water in the channel and drops in water levels after they have gone to their hibernation sites could put them at risk for freezing. It is also possible that they might choose to nest in the flood planes instead of above the flood plane because there will be some sandy areas that are attractive to them. Any flood flows that occur during the summer after they have nested but before the hatchlings have left, typically June July and August if there is significant flooding in the flood plane the eggs or young turtles could be killed by this flooding. Extreme flows could affect wood turtles. There are also blandings and spotted turtles that have been recorded. These are less likely to be found in the river channel but more accustomed to living in some of the back water swamps that are connected to the river in terms of flow. They have similar sensitivities to water levels and have same requirements during the winter to not freeze, same habitat requirements as wood turtles.

There are a few birds on the list for the Lamprey that are wetland dependent and their prey species are wetland dependent, water dependent. They may nest in vegetation just

slightly above water levels. They would be sensitive to flooding during their nesting seasons and are dependent upon summer flows to maintain the habitats that they feed and breed in. Eagles and Osprey are also recorded from the Lamprey area. Ospreys nest in Great Bay and eagles winter in Great Bay, and there are probably a number of transient individuals that may use the Lamprey River for feeding, they rely on flow dependent prey, they are fish eaters and we are going to take some of the fish information that Piotr is going to develop and use that to evaluate how flow changes might affect these species.

Flood Plane Transect Model – This model we will be using for most of these evaluations. We will be doing cover types of the different habitats along the river from the uplands to the flood planes and across the channel to the other sides. We will survey in those transects identifying the elevation differences between the plant communities that we are looking at. We will plot water levels that occur at different times of the year. This would be a different flow regime for proposed changes we could evaluate changes of what the current situation is to, for instance, reduced flows throughout the growing season, plot those, and that will give us some idea of how the cover type areas might change. If these changes were permanent you might get a decrease in forested wetland area, increase in other things, flood plane areas, depending on what part of the river the changes occur in, how permanent they are, how significant they are. You can actually calculate the area that has changed. For those species that are adapted to those different habitat type if we have suitability indices information we can apply that to a calculation and actually become a little more specific on how flow changes might affect a given species in that habitat. To the extent that we can, we are going to be setting up, we haven't selected all of our sites for all transects yet, but we want to set them up so that they include several different IPUOCRs along each one. We may have a rare plant as well as a wetland complex that is a habitat for turtles as well as a channel that might have river weed or something else that we would be interested in looking at. That is it for plants, wildlife and natural communities.

Questions

Senator Barnes - How many turtles do you think there are out there?

Lee – As far as the numbers of turtles?

Senator Barnes – Yes.

Lee – The best reports are the ones that have done by David Carroll and some people that have actually continued some radio tracking after him. I don't know that they have actually tried to apply numbers. Within the study area that we are looking at, there is a known population of wood turtles, but I don't think there is any estimate of how many there are.

Senator Barnes – How many babies do they have?

Lee - They will lay clutches of usually 4 to 10 eggs at a time. The time between egg laying and hatching is somewhat weather dependent, temperature dependent. They are typically laying eggs in late May/June and hatching by August/September. The wood turtle is the riparian turtle that is the one most likely to be affected by changes in flow in the river channel itself. Spotted turtles and blandings turtles are also very much of concern. There have been a couple of blandings turtles locations that are being followed. Spotted turtles have been rarely seen there, but they are always difficult to see and so it is difficult to estimate what the populations are because they are very secretive, you have to sneak up on them to get a good look at them and they are hard to track or find.

Senator Barnes – What about snapping turtles?

Lee – There are doubtless many snapping turtles, probably plenty of painted turtles, lots of turtles, there are a number of different turtle species in the river.

Carl Paulsen – You mentioned bald eagles. I don't know if you said this earlier, what are they eating in the winter time, are they eating fish?

Lee – In the winter eagles will eat a variety of things, they eat fish in open water areas that are not frozen over, so below the falls, below the dams. They will eat carrion, they will

eat mammals, they will eat ducks, and whatever they can get. Many times they will eat things that they find lying around.

Wetlands– Description of Various Types of Wetlands - Piotr.

We proposed working together to obtain more detailed aerial photography and to try to get a lot of this information out of these aerial photographs. It was a nice process to provide this information about different elevation of various types of wetlands that can help us predict different scenarios.

My team consists of me, Joe Rogers and Jack Legros. We are analyzing the instream fauna for most, and similarly like in the Souhegan, we identified three major groups of animals.

Freshwater Mussels - This will be freshwater mussels, and on the Lamprey obviously freshwater mussels play a relatively important role. We have twelve species of freshwater mussels that are native to New England. Fresh water mussels belong to most endangered fresh water animals on the continent. The United States is the fresh water mussels' capital of the world. It is a very important element of aquatic communities that we need to look into. We have healthy population of six species occurring in the Lamprey. What we know is important for mussels, mussels need a relatively stabile river habitat conditions, and therefore they must have a constant situation. What is also very important about freshwater mussels is that they have this very interesting life cycle. They cannot live without fish, and are therefore tied to fish ecology. If there is no fish habitat, there will also be no mussel reproduction. Mussels are relatively long living organisms and sensitive to water pollution.

Aquatic Insects and Macroinvertebrates - Another important part of aquatic fauna are aquatic insects and macroinvertebrates of which the most charismatic are dragonflies and damsel flies. Others are odonates and snails and all of these have some seasonal flow and substrate needs. In the future consider looking into selected groups of macroinvertebrates most likely dragonflies and damsel flies.

Senator Barnes – The dragonflies, don't they somehow control mosquito life?

Piotr – They feed on mosquito larvae to some extent, but bats are better for mosquito control.

Senator Barnes – They may help hold it down, is that correct?

Piotr – Yes.

Fish Species – We have several groups of fish species to think about. We have the resident native fauna. Those are species that live in the river for different parts of their life and these are those that have to have their habitat conditions provided the entire year round. We have species that are migrating in or out of the river for the purpose of reproduction. We also have several rare and endangered species and for all of them we have to think about the adult life stage as well as the reproductive life stage that has different habitat needs as well as the juvenile stage. We know that baby fish need a completely different habitat conditions than the adult fish.

Fauna (from the DES homepage, Souhegan 2003 baseline community) is pretty representative to what we have seen in most of New England. We have a large number of species but we also have species that originally didn't belong there. There is quite a considerable amount of non native fish species that were introduced by humans. Common shiners would be the boss resident fish. Sun fish is a pond type of fish and is the second biggest and some large mouth and small mouth bass in relatively high proportions. A number of species that utilize the Lamprey River and not only need passage but also need habitat, and those are alewife, Atlantic salmon, American eel, American shad, blue back heron and sea lamprey and all of those will have to be taken into consideration. We have several species of concern or special interest species which are brook trout (only in fast flowing area and upper areas of the river) banded sand fish (which is an endangered species), bridle shiner (a small minnow) and red fin pickerel are all very important to consider.

Flow conditions (seasonal) – Divide the river into bio-periods and for all of these bio-periods we will use different group of indicator species to determine how much water they would need for survival. In the last project we selected the mesohabitat simulation method for this purpose. We have a lot of similarities but a lot of substantial difference between the Souhegan and the Lamprey. We want to apply the lessons that we have learned the lessons that we learned on the Souhegan right away. A lot of this is very applicable and can make our results better. The major difference between the two projects is the designated reach is very short compared to the entire watershed area. We would be mistaken if we would focus on this part only and disregard everything else that is happening upstream especially since most of the water users are happening upstream. We want to pay attention that in order to improve the designated reach we will not damage anything upstream of the watershed. Our goal and task is to identify portions of the watershed that will need special attention.

Designated reaches – The on-ground survey and the aerial survey allowed us to identify several sections within the designated reach. We have identified in section one relative high gradient, but it is impounded by waterfalls and a former impoundment that is breached in the waterfalls and then flows strangely straight out. It is a high gradient stream with a lot of riffles and fine substrate. The lower portion of designated reach is only ½ mile long. If you want to focus on river end species, it is obvious to us that this part will be the most vulnerable to flows. This is where most of our field work will be concentrated. One of the lessons we learned from the Souhegan and want to apply here is to rely on aerial data collection rather than mapping the river on foot. Hike selected locations and collect habitat information. On Lamprey we would like to be much more focused on collect aerial data and flying the river multiple times and analyzing aerial photographs to identify specific habitat. We can gather data quickly and have solid documentation that lasts for a long time. One example why it can be very useful is that on the Souhegan we have realized that because of a large time span between multiple surveys and several floods, the conditions in river have been modified. Purpose of habitat data collection is to describe the distribution of hydromorphologic units, we do it at multiple flows, and then using the habitat use information that has been developed on different rivers we determine if these areas are good or bad for fish.

Senator Barnes – What about pollutants such as mercury that affect fish?

Piotr – It is outside of the scope of our study to incorporate pollutants. We review the existing information but it is not in our contract to collect the data on the pollution and the impact of the pollutants. It is included indirectly. With our study we will be able to say if habitat is a limiting factor. For example we are missing some species and there is enough habitat for them. Then we can go and say okay there are some other reasons why we don't have these fish. It may be pollution or temperature and we analyze water quality data.

Representative Bishop – What level of flow do you want to maintain?

Piotr – I will tell you this in about a year. We do not know now.

Representative Bishop – You are looking at the seasonal low level or mid level or seasonal high or seasonal low?

Piotr – Within the seasonal we are mostly focusing on the low end of the flows where human actions could limit habitat by taking the water away. It is definitely where our focus area is. In the summer we will be watching the low flow conditions and during the other seasons we will be watching for limitations from the bottom. When dealing with wetlands obviously some high flows are missing, and that is different.

Representative Bishop - My concern is that no matter what section of river you are looking at on seasonal low the whole river is at a seasonal low. If you are going to maintain a flow, where are you going to get the water from if you don't get it from upstream?

Piotr – That is why we have to look at the upstream sections. The question is hypothetically you could have a situation that you want to maintain higher flows here and release water from somewhere and at the same time you damage this other portion of the river. So that is what we want to look for.

Representative Bishop – You do have one dam above the area that you are looking at, and it is on the other side, the northerly side of Epping, between there and Raymond there is a dam. But once you start using that water to maintain a level on the lower part of the river, you are going to be taking water from upstream, which that is already at a seasonal low.

Wayne Ives – The thing we need to reiterate here is that the basis of this whole assessment is that we are trying to maintain a natural flow. If there is a normal low flow somewhere, draughts happens, we are not trying to change that, all we are trying to change is the impact of withdrawals and other management activities on those flows. So a low flow that occurs is okay, we are not going to release water because there is a low flow. We are going to release water because there is a low flow that has been dropped even further by withdrawal. We might try to replace that withdrawal with some water from upstream. We are not going to try and make sure that there is a low flow that is held up above a certain protective level.

Representative Bishop – That is why my first question was at what level are you looking to maintain. What level of flow are looking to maintain, a seasonal low, or between seasonal low and season high, this is what my question was.

Wayne – There are certain seasons, like the spring, we expect to see higher flows and we probably will not be able to withdraw enough water to cause a significant impact on those, so mainly what Piotr was talking about in some of this is looking at some low flows where in the summer time where flows get down very low, if we take more water out during those periods we need to find someway, sometime to replace some of that water, probably not all of it, but some of it might need to be released from the dams or we might need to cut back a little bit on some of the management alternatives that we have between dam management, conservation and affected water users operations plans so that they might withdraw water at certain times of the day and not all at once in a short period of time, spread that out over time. Some of the management alternatives will respond to the withdrawals of water but we are not going to be trying to prevent a draught. If there is a draught happening, that is going to happen and we are not trying to change the low flows that occur by that. Those draughts only happen every once in awhile. If we take a lot of water out every year then that is like have a draught every year and that is not something that fish and other habitats can sustain. They need to have a draught sometimes, but other years have higher flows. We are trying to identify the differences between those and the timing, duration and frequency and how often those things actually happen. And make sure that whatever we do, we don't disrupt that to such an extent that those fish cannot survive through those low periods because the next year they need to have some better flows in order to recover from that draught. We need to make sure that whatever we withdraw from the river is balanced out by some other mechanism, some management alternative so that we can keep the flows in the river at the level as the draught not lower than the draught and not at a draught level every year.

Representative Bishop – The concern I have is our own water supply and if you are going to be withdrawing water downstream to look out for the fish, we also what to look out for the residents of the town and that we have an adequate water supply.

Wayne – That is why this is a balanced program to look at both needs. We are not looking just the fish we are looking at the water needs for the water supplies.

Representative Bishop – Maybe somewhere along the river you could put a dam in below the town water supply and help regulate there.

Piotr – As Wayne very nicely answered this questions. The answer is not easy at this time. I will not know until we investigate this river and from my experience we always have surprises. Whenever we go to the stream and start working on it, it always turns out to be something different than what we expected. On the Souhegan it turned out to be temperature as a major problem. It is impossible for us to say now what flows we will try to maintain. We will know at the end of the study.

Piotr – The result of this type of activity is to present the amount of habitat for various species at different range of flows. Another part of our work is to investigate impoundments. It is part of work to identify potential habitat there as well as to try and figure out what is under these impoundments and frequently we see multiple studies and we might find water falls and rapids on the bedrock well beyond specific impoundments and this will be necessary later on to develop reference conditions for habitat conditions for the Lamprey River and what it would look without impoundments. Another task is to compare baseline fish community which results from Souhegan where we can identify if the expected proportions of the species within a baseline community correspond with amount of habitat that is available. Based on this analysis we will be able to say if there is enough habitat for fish, plenty of habitat on Souhegan for brook trout even though there isn't any. Next we would determine what would happen to try and develop habitat conditions without human intervention. Try to determine how habitat conditions would develop with flow and then actually connecting this with flows and develop user technique that marries pristine habitat to which the fauna is adapted with a flow time series and then create habitat time series and analyze for how long in a natural condition habitat would stay under specific levels. This allows us to identify specific thresholds of frequency and duration. This allows us to define rare habitat conditions, typical habitat conditions and critical habitat conditions. Further analysis of the shape of these curves and duration curves will help us to figure out what are the rare durations, critical durations and common durations of specific habitat conditions. This will help us to develop a matrix of common habitat that should be provided for example brown trout. How much flow needs to be in river for this habitat and for how long. This will be the basis for our final recommendation if a potential release of flow augmentation is necessary.

Representative Bishop – In order to maintain the flow, you may be recommending removing some dams?

Piotr - Maybe, one thing that is always part of our analysis if there are dams that are not used for example. Frequently the first step when we do this type of scenarios is we look for dams that are unused that have no added function, they are just a liability, and try to determine how much benefit would I have if I removed this dam. There are two differences. One thing is to develop, to answer the question, *what are the needs of the fauna for habitat and flow*, we try to figure out what were the pristine conditions to which fauna is adapted. The second step when we prepare our recommendations we will also look into the possible restoration scenarios and possibilities for restoration. So unnecessary dams or park areas where you could add wooded debris or something else because what we have learned on the Souhegan, sometimes maintaining water, maintaining flows is not enough or might not even change anything. You might get better results if you improve the river corridor.

Wayne – I think what we are confusing is a byproduct of the investigation with the results of the investigation. The byproduct of the investigation includes having information about what the habitat would be behind the dam if the dam wasn't there. Removing the dam isn't really part of this and this is not the idea of the instream flow program. It identifies what you would get if you did remove the dam. Part of the water management plan isn't to remove the dam, it is just that when we are doing assessments it tells us that kind of information also. So to include it in the results is information that says what the river would look like without all the dams. If you decided later that you didn't like a dam because it is not being funded, it is in decay, or some other reasons why you want to pull it out, you already have the information that says what the change in the habitat availability would be. The water management plan doesn't say we are going to remove dams in order to meet this. The water management plan says we are going to use dams for releasing or storing water. We will also have that information from this assessment that says what we would benefit from, what would be gained or lost if you took a dam out.

Carl Paulsen – DES has spoken of this process as a potential framework for a way to implement a narrative flow standard on the water quality standards, but under the state's anti-

degradation program there is a reservation of something like 10% buffer around the water quality standards that you are trying to meet. So if there is a numeric standard of 5mg per liter of water quality parameter, then there is a buffer that you build in of 10 percent so that you never quite get to that water standard level. Then there is another level of this in the water quality standards, but in any case that reserve buffer of 10%, if DES is intending to use this as kind of a mechanism for getting at flow detection, then is there a way to build into this that 10 percent buffer so that the management plan comes out, protects flow with that 10 % safety buffer built in and have you talked about that at all?

Wayne - Antidegradation Rules are a whole different thing, because you are talking about mainly water quality issues and now you are talking about 10% buffers between what is released. The Antidegradation Rules say if you have a water quality of such a level the only reason you would allow it to be degraded would be for some public use. I think that we have other issues that I am out of the loop on as far as NPDES or releases and things like that which have less to do with water quantity than they do with water quality. I think the idea is to reserve a certain portion in the river for future uses.

This process starts out with what is the reference conditions - in order to get the baseline condition we have to start with some kind of a level of understanding and then say here is where we are if we have no dams, no changes, no withdrawals - so this is just the raw starting point. From that we can say here is where we are now and then try to address, recognizing that we have needs to discharge water from the NPDES permits and that we are also recognizing may cause some damage to the river but we allow it because we need it for public uses. Same has been happening in water quantity, we are going to need some water for off stream uses and whether we use a 10% buffer is different. The idea that there is a need for public water off stream and there is going to be some use. We are not trying to go back to the bare bones reference condition, but we are recognizing that this is the base line conditions that we started with if we can reestablish what those were.

Carl – My questions is under the Water Quality Clean Water Act and the Water Quality Standards we don't let it get below those standards except in extremely rare situations in theory. So the question is the protected instream flows, the number that the narrative flow standard gets interpreted, gets defined as. If that becomes a numeric standard, i.e. this is the flow we intended this time of year is there going to be an attempt to build in that 10% buffer to that number and I recognize that building a 10% buffer because of what the complexity of this issue, I don't know how you would necessarily do it, but it is an issue that I was wondering if you have been talking about because it is a part of the NH WQS, that 10% buffer..

Wayne – I think when we develop the numbers that is what we are saying the numbers are. We are trying to protect at that level. The need for a buffer isn't there. I think that if you have a number and it doesn't matter who is using water where, or how much, as long as we protect those flows for those periods of times with durations and frequencies of currents at those magnitudes. As long as those are protected, we do not need a buffer. The idea is those are the numbers.

Carl – Well the state has already said by policy that they do need a buffer that is my point.

Wayne – This is another question because you are talking about water quality issues that are based on statistics, I understand what you are saying to a certain degree but this is something we will have to delve into.

Carl – I think it something that we should be talking about at least so we all know what decisions are made here.

Wayne – The identification of what is the actual meaning of those protected flows and the durations that we are incorporating into those. What they actually represent I think is a very valid question.

Ralph – The State of Maine is wrestling with this issue right now. It is tricky in terms of all the things the Clean Water Act says that you are supposed to do. I read this the same

way as you do. The Statute is written that these protected instream flows will at some point become a WQ criterion for that whole water, but to go from the number to the criterion, there is a lot in between those two things. On the plus side you are going to have a lot of information once you have done the studies and then sit down to see how it applies.

Tom – Now switching gears, what Don, Piotr and myself went over, we were basically trying to answer the question *how much flow does this human or nonhuman entity require*? That is basically a foundation of our field presentations.

Task 2 – **Management Issue** – **Tom –**Task 2 is looking at whether or not there are interactions with groundwater withdrawals and if there is then can you use certain management strategies on the groundwater withdrawals that might help out instream flows when the time arises. Are there any impacts to surface water due to groundwater withdrawals and again this is in the legislation, the legislation that led to all of this identified that instream flows are supposed to be done by flow management and even identified that for the groundwater influence you are to look at any wells within 500 feet of the designated reach or any of its tributaries. As with the Souhegan, on the Lamprey if there are wells that are just outside of that 500 foot limit, we tend to look at those also because it is not that difficult. If there are groundwater wells, can reductions to them or pumping assist in the management plan and the next question is, okay if the answer to that yes, well is that the strategy we should be following. Just because a well may be taking surface water, does not mean that ultimately that is going to be something that gives us the biggest bang for our buck.

Do groundwater withdrawals reduce spring flow and one simple question you can ask well if you hadn't been pumping the groundwater where was that groundwater going in the first place because it is moving some where. It could be discharging into the rivers, it could have continued as groundwater or it could have moved deeper into the ground. In general groundwater moves downhill, groundwater seeps into streams and moves toward the stream and it could actually seep below the stream. Without groundwater pumping the water would have ultimately arrived in the river. In one case intercepting water that would have gone into the river and in the other instance you are taking water from the river because the well is deeper than the river and is pulling water from the river so you are taking water out of the river. Key is cone of depression around well, stagnation point, very simple test recognize when stagnation point reaches the river is when you reduce recharge, reduce pumping so that it is not pulling water from the river. We need to know the slope of the groundwater gradient, calculate stagnation point, distance the well is from the river, 500 feet from the river.

Senator Barnes – How about a large outfit, USA Springs, who will be withdrawing a large amount of water.

Tom – I am smiling because I have been involved in this since the beginning.

Senator Barnes – You have been involved so tell me if it is going to bother the Lamprey River.

Tom – Well that is an answer just like the previous one. We have to go through the study first before we get to the answer. USA Springs is a potential withdrawal which could occur in the watershed. One of the problems specific to that is associated with instream flows, that is deep bedrock and quite honestly we don't know how deep bedrock is connected to surface waters. Tom wrote a paper on this for the Town of Nottingham and the surrounding towns on how this might affect the Little River.

Senator Barnes – Legislation failed last week 13 to 10, so the Senate was not able to stop it.

Tom - Whether it was USA Springs or a subdivision with 75 units there are going to be continuing development pressures on the water resources in the seacoast region. In the Souhegan and this study we tried to look forward and tried to accommodate those. What a study does right now is, under today's conditions and with the foreseeable withdrawals these are your critical spots, and at that point any future proposals have to recognize that is it and

would have be accommodated by adjustments to the management plan. It is not a trivial exercise. The vexing point is always large bedrock withdrawals because we don't have a good grasp on the recharge mechanism nor the discharge mechanism to bedrock.

Representative Bishop – In a deep well, is that through bedrock or down to bedrock?

Tom – In general a deep well?

Representative Bishop – No water table, USA Springs.

Tom – They are all in bedrock.

Representative Bishop – Just in bedrock?

Tom – I wouldn't say just. Some are 600 to 800 feet deep.

Representative Bishop – How far is it to bedrock?

Tom – It varies on that site anywhere from 30 feet to 100 feet. All of them are bedrock wells, they are cased off in the rock.

Representative Bishop – Undoubtedly would be drawing on the river as well?

Tom – No, I cannot say that. I just said, we don't have a good idea of where that water comes from. I don't know.

Representative Bishop – Will you find out then?

Tom – As a true academic would say, that would take more study.

There is a very simple equation to calculate this stagnation distance. Once we calculate that stagnation distance, or we can calculate the flow, and move the stagnation point to the river and then at that point it is simple to compare what is being pumped from the well to the flow that would use this stagnation point to the well. If we are pumping at a flow rate at which the stagnation point doesn't reach the well that well shouldn't be included in the management strategy because it is not going to get you a very quick increase in the stream flow by reducing its pumping. If a well is inducing recharge and the data tells us that, then you could use some reduction in well pumping to try to get more water into the river and that would be not immediate but within a day or two. If we are looking at bedrock wells, studied hundreds in the seacoast area and these wells have some eerily consistent properties throughout the seacoast. They vary on site specific but the difference is looking at the region versus looking at one specific well.

Office technique, you get a better estimate after we do the analytical equation. If someone had a bunch of wells in there, we could actually go in and take that data and get a better estimate. Rarely does this occur, rarely has someone already done the work for us. This is pretty expensive to do. We have relied on in the Souhegan and what we are going to do in the Lamprey is we use wells that are put into the riverbed called miniature piezometers. With these miniature piezometers we can get an estimate of reduce recharge and with this we can verify what the calculation was. With the Souhegan we could do one site a day.

Tom explained recharge, cones of depression and where information and data came from and then calculate. Wiswall dam diverting surface water, more of a surface water withdrawal, some potential sites proposed.

Carl – One quick question is there a seasonal component or climatic component to the stagnation point.

Tom – Yes. Simply put I usually evaluate the worst case summer conditions. Again we have the aquifer maps from USGS and that is the State map that is on the web site. So for all those wells, three had issues of potentially inducing recharge. Again that is just a numerical estimate.

Vern – In your report of the Souhegan and I assume it is going to be the same question for the Lamprey, are you going to show just the potential for induced recharges for the wells or are you also going to show the amount of water each of these is actually intercepting.

Tom – All we can say is let's say there is a well pumping 200 gallons per minute. You may see that it is not inducing recharge, whether or not that 200 gpm would have wound up in the river or would have flowed parallel to the river, we don't know. We cannot say conclusively that 200 gpm, this is not a well that is not inducing recharge, so we cannot say

conclusively that the entire 200 gpm would have wound up in the river, because it could easily be flowing parallel to the river in the sediments. There is an issue about exchange, water going back and forth, but that is well beyond the grasp of this study. But you could say it most likely is going towards the river and the river is acting as a drain. In the big picture, in the big water management strategy, if you have huge withdrawals of groundwater and that is it, then the next thing we have to think about, is there any return flows associated with that and where does the return flow come in. Just withdrawing groundwater is one thing but very often we are not consumptively using all of it.

Representative Bishop – How much of it would be returned from USA Wells:

Tom – Very, very little and it is true for evaporative cooling too.

Tom – We followed up those flows with miniature piezometers. We would put in wells every 100 feet and what we were trying to look at is if we did estimate that there was induced recharge, we definitely went out and did those wells. Some of the wells where we estimated there was no induced recharge, we also went to and put in miniature piezometers, because this is a verification process. Analytical method was very, very close.

Al – Last two things to point out – **affected water users** and **affected dam owners** – As part of the study what is going to be done is an inventory of affected users and dam owners. We have collected some of this information already, but we have put together a surveys, questionnaires to develop profiles on and get an understanding of the uses, amounts of water, when the water is being used, so some of the affected water users have not been approached yet but have been identified, and lastly there are a lot of dams relative to study area, designated reach. The dam of interest here is the Wiswall dam, but again these impoundments that are upstream in the designated reach may have or do have an affect on water availability within the lower reach of the watershed. We will be collecting information. Focusing on Wiswall and there are a number of studies being done relative to that dam. To close here information relative to the project we obtained from DES website, UNH website, and then we have a number of contacts.

Tom – Letters go out to all these entities, selectmen, the conservation group, and any water committees, they all get letters, also interested in future proposals, continually query towns, wells and water intake. This is a watershed wide approach. Any other elements split that way watershed wide.

Al - Relative to this study just one dam in designated reach, a number of impoundments outside of the reach. It is watershed wide instead of designated reach wide, IPUOCRs designated reach but water comes from the whole watershed. Over the whole watershed 500 feet of a tributary to a designated reach. In terms of the actual resources, we are confined to the designated reach. That is not to say that if something we are doing on the designated reach or something we are doing is part of water management affects some significant resource in the watershed, we are not going to mention that, we just cannot study it in detail. That certainly are things we want to know about. If our water management plan involves changing flows in a tributary and there is some critical resource there that the town knows about, we want to know about it too because we certainly need to take that into consideration.

3:15– 3:20 **<u>Other Business</u>:**

Wayne – I just want to reiterate that if you do have comments or you need copies of this presentation please let me know by email. I want comments either written or by email, I prefer the electronic version, please try to get back to be on Monday two weeks from today on February 27th. February 27th is the deadline for getting comments back to Wayne. The result of this will be is that we will review the comments and then make any changes that we can justify from the comments into the document and the next step will be to present this as a final document with responses to comments. From there we will take this task 4 report and use it to continue and get on with field work for assessing the protected flows. The next step after this will be to put final report out and go on to Task 5. All of the presentations will be put out on

our web site. They will be out on the UNH site in a week and on DES site as soon as we can get a copy of them. Deliverable for this project, the consultants are required to do, interim task, documenting IPUOCRS and documenting what we plan to do. .

3: Meeting adjourns 3:20 pm